



REALIZATION OF THE PARADIGM OF ARTISTIC EQUILIBRIUM THROUGH MEANS OF ARCHAEOASTRONOMICAL ACHIEVEMENTS

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ABSTRACT

Man's impulse to aesthetically encapsulate the dynamic, joyous, creative spirit of the universe manifests itself in the various forms of artistic achievements and architecture is one such act of creation which not only embodies this essential independent spirit of creation but also stands testimony to man's endless desire to affirm his position against a grand, cosmologically valid context of highest form of truth. This paper aims to show how once astronomy and religion both conspired and conjoined together in a mutual embrace of rational artistry thus giving birth to a scientifically inspired form of spiritually significant architectonics.

KEYWORDS: Astro-aesthetics; Architecture and Astronomy; Archaeoastronomy.

INTRODUCTION:

Man's quest for discovery of the true nature of the creation and his relation to the creator has been based upon some carefully patterned and meticulously organized steps of knowledge. This act of patterning includes affirmation and reaffirmation of man's long cherished belief of sharing some common bond with the creation in its grandest scale. Man has always been a worshipper of beauty and an avid aspirer after truth and in his quest towards uncovering the deepest mysteries of Universe a portal to a wondrous realm has now opened before him whose very nature cannot be comprehended concretely and completely in terms of what we know at present; and with this he comes to realize that truth and beauty in fact share a more complex relation of interdependence and interwinement than what has been assumed so far. Nevertheless a true symbiotic co-existence and mutually reinforcing relationship between science and aesthetics can be appreciated if we carefully look into and analyze existing relation between archaeology and astronomy. Man's pattern of analyzing his relation with the greater powers governing the creation from above has undergone numerous paradigm shifts and most of them have been captured and faithfully represented via various artistic and cultural works. The methodological centre of this whole thesis is provided by Vetrivius Polio's statement which states that the knowledge of architecture would be incomplete in the absence of any reference to the science of astronomy.

VISUALIZING THE MACROCOSMIC:

Man has attempted to describe and depict the cosmic order in terms of familiar architectural imageries. Progress of science relies upon the creation of new steps to descend to the heart of a deep unknown and man has tried to interpret the unknown in terms of the worldly and known. In doing so he has knowingly or unknowingly formed many patterns of myth, fables, legends and stories all of which bear testimony to the interconnected nature of human consciousness. Legend of the world tree is one of such recurrent myths which appear in the legends and mythical tales of different cultures across world. A tree symbolizes both a life-force, a dynamical creative urge and a source of meaning or centeredness which is not only highly meaningful in itself by virtue of its possession of a number of invaluable traits like having deeply penetrating roots going far beneath the crust of the earth thus providing it with an unquestionable stability; its over-arching branches and its bearing of fruits, flowers etc. Trees almost connect the earth with the Heaven above it. This is why we find trees serving the role of a mainframe behind various architectural interpretations of cosmos. Both Chaldeans and Phoenicians believed the tree to be at the centre of our world and in the legends of Japan gods broke their swords against the tree. In the Norse mythological saga Yggdrasil is the tree which connects nine worlds in its cosmology. This habit of envisaging the creation as a tree was later supplanted by imagining Earth as a flat plain surrounded on all sides by a sea and the ceiling in the form of sky.

In the period which immediately followed it the stars, the sun and the moon – all began to be portrayed as issuing from a hole in the east and sinking through another hole in west and it was thought that they could travel unimpeded between the heaven and earth by traversing a subterranean path which lied far below the Earth's readily visible surface.

The ancient astronomers of Egypt also conceived that the sky was fluid and the earth was resting on a solid atmosphere enclosed by a liquid sky on all sides. When forms began to emerge from the elemental chaos God raised the waters high above and spread them out in space. Egyptian inscriptions as found upon the lids of the mummies and on the walls of various temples also contained references to this cosmogenic belief and also showed various natural forces and events in personified forms of different deities. So the main architectonic compo-

nents of the picture of Earth at this time consisted of a chamber-like Earth shaped either square or round and an over-arching firmament lying like a great ceiling overhead. The aesthetics of imagination was unmistakably very powerful in the portrayal of sky as a liquid ocean or in the incarnated representations of natural phenomena in the form of various semi-human divine entities. Stars burning like eternal lamps and hanging from the sky above and souls merging like sacred flames with a universal presence after death also point toward man's innate imaginative faculty and his power of aesthetic reconstruction of cosmogenic ideas. Genesis also treated the sky as a fluid.

Cosmogenic theories expressed in Vedas also have a distinct aesthetic appeal of their own and they also relied upon some fundamental architectural solutions for basing their ideas upon. Here Gods themselves have been depicted as architects of the highest type as Varuna first arrived on the scene to measure everything up with Sun as his measuring rod and then the earth, the air and the heavens were divided into three separate stories or flats. Further tasks of compartmentalizing and distributing the dwelling places for men, deities and demons were done by Vishnu and then Indra while Dawn herself opened up the gates of light. Agni was then summoned by the gods to arrive on the bosom of the newly created world.

In Zend Avesta too the sky is said to be built with some celestial substance whose ends lie so far apart that they will remain invisible to the eyes of common men on Earth.

The Turanians of Chaldea also thought of Earth as the surface of a sphere and the insides of it was hollow and filled with death and darkness.

The Homeric scheme of organization of Cosmos was described as being depicted on the shield of Achilles. Thus we see the use of architecture for encapsulating and aestheticizing the macrocosm through microcosmic, miniaturized representation.

Hesoid thought of a giant brazen anvil which was falling from Heaven to earth in nine days and in another nine days from Earth to Tartarus or the world of dead. Anvil is a very powerful symbol of man's constructional activity and its rise and fall represent the dynamic nature of the creation itself. All such conceptions of Universe or Earth as a giant system governed by a divine purpose basically imagined the world as a manifestation of some eternally existing life-force. Homeric earth was surrounded by ocean and was placed midway between metallic heaven and Tartarus. Heaven consisted almost entirely of the Olympus Mountain which was the abode of the gods. Theophrastus said that Milky Way was the juncture of two solid domes which was so loosely constructed that light from beyond could easily pass through the fissure while many imagined that the patchy band of Milky Way was merely the reflection of sun's light on the vault of the dome.

Then came the period when earth was beginning to be imagined as a spherical structure and Pythagoras was one of the most famous advocates of spherical theory of earth as well as the sky. Babylonians also held the belief that the universe was spherical. Chaldean astronomers hypothesized that the cosmos in fact consisted of seven concentric spheres all revolving around one central axis and the pole star was thought to be present at the centre of the world. The firmament was made of ocean of celestial waters and the scheme of ascribing different colors to each of those different spheres had a religious value whose origins can be traced back to the Babylonian religion. Pythagoras divided the creation into twelve spheres or fixed stars. He conceived the planets or spheres to be conjoined in a mutual harmony of musical rhythm and this idea was also expressed by Chaldeans. Imagining the entire creation as one hypnotized soul engaged in a cos-

mic chant while moving through the heavenly fluid is irresistibly appealing and transcends the bounds of mere architectural portrayal. Poet Job writes about a time "when the stars of the morning sang together," and Shakespeare also says in his 'Merchant of Venice' "There's not the smallest orb which thou behold'st / But in his motion like an angel sings," (The Merchant of Venice, Act 5, Scene 1). Pythagoras conceived the Universal architecture to be designed as a great monochord with one end of the chord attached to the heavens above and another part goes through our mundane earth. The first and topmost division of this great palace-like Pythagorean universe consisted of Empyrean or the sphere of the fixed stars which was the home of the immortals themselves. Pythagorean conception of Universal architecture also bore immense similarities with Jews imagination of a candlestick universe.

The Arabs envisaged the entire universe as a seven storied structure in which there was seven divisions in heavens and seven divisions of earth itself. Quran says about this sevenfold division of heaven and multiple forms of earth. The first story of the heaven was thought of as being composed of pure emerald; the second of white silver; the third of large white pearls; the fourth of ruby; the fifth of red gold; the sixth of yellow jacinth; and the seventh of shining light. Thus we see aesthetic impulse and architectonic beauty all came to their full force in the process of depiction of universal architecture and this was always most conspicuously present in the description of God's dwelling place. The earth again was conceived as being encircled by a giant ocean while the ocean itself was bound by a chain of mountains called Kaf and either Mecca or Jerusalem was thought to be the centre of the world. There was hell or Jahennem beneath earth and a sea of unfathomable darkness. Man's reliance upon maintaining hierarchy in the arrangement of place and granting of position to different entities is one of the most elemental aspects of architectural narratives. Also a close association between man and God himself was also discernible along with an association based on the idea of mutually influential interrelationship between man and astronomical bodies. This symbolized a close and deeply interwoven relationship between man and the rest of the universe but as science grew more mathematical and began relying more on empirical observation and careful collection of data this relationship between man and the rest of the natural world got immensely weakened as the separation between the Universe and man became evident and in the hierarchical arrangement the gulf between each stratum became unbridgeable. However the essence of Vitruvius' statement that all knowledge of architecture has its roots firmly settled in astronomical inspirations has never become obsolete.

Now we focus on Dante's picture of universe. Dante's cosmogenic conception consisted of the heaven or the Empyrean and the concentric circles of heavens, paradise, purgatory, and inferno. God Triune was imagined to be presiding over all realities and seated on his throne upon the circle of the heavens much like the Pope in the chair of St. Peter. Different categories or orders of angelic beings were described as surrounding the throne of God Almighty. These angels belonged to three main orders - seraphim, cherubim, and thrones. The earthly religious and political life formed the basis of his imagination of cosmic hierarchy and the whole system of concentrically arranged spheres, each revolving within the one above it and together all revolving around the earth, subject only to the primum mobile remind one of the feudal system of Western Europe in which Emperor assumed a godlike authority presiding and ruling over all other subjects.

Many scholars have pointed out the structural and functional similarities between the world and the temple and man in those ages was mostly guided by some mythical, supernatural explanations of cosmology and this resulted in a close association between religious ideals and cosmogenic principles. The descriptions of Earth occupying a place just below the Heavens which is in fact the home of the Supreme Creator and Hell occupying a place beneath all divisions of creation doomed forever to remain engulfed in eternal darkness and endless pain and the picture of the sky or a firmament as the crystalline ceiling of the world while another over-sky forming part of the roof connecting the lower part of Heaven to the sky, or imagining earth as being encircled by some endless chain of mountains or some great ocean etc. appear in the legends, myths and fables of almost all the cultures across the world.

In 'The Study of Astronomies in Cultures as Reflected in Dissertations and Theses' Stephen McCluskey examines various dissertations and theses which have dealt with astronomy's influence upon culture and role of astronomy in ancient cultures ranging from prehistoric Ireland to precolonial North America.

TO SEE A WORLD IN A GRAIN OF SAND:

Now man was not only satisfied with only imagining the macrocosmic realities in terms of microcosmic imageries but he ventured further to find even more appropriate means of articulating his desire of establishing perennial bond with the soul of the universal being and this resulted in the creation and construction of various sites and structures of astronomical as well as religious significance. Whether these are the engravings upon the shield of Achilles or the pictures painted upon Keats' Grecian Urn, man's desire for finding a lasting and most harmonious relationship between truth and beauty finds expression in innumerable types of buildings and sites like temples, sites of burial or cremation, palaces, lids of coffins etc.

Many monuments of especially high cultural, social and religious significance across ages in fact share a common bond among them in terms of application of astronomical knowledge like stellar or planetary alignments which were used to determine their location. Man has always attempted to predict with maximum possible accuracy the influence of natural forces on their pattern of life and use that knowledge for determining his own course of action which might enable him to adapt himself to his environment in the best possible way. There is a rhythm in the rise and fall of tides, in the rising and setting of the sun, in the cyclical pattern of seasons and in the emotional variabilities in human mind itself – all of which have intrigued man since time immemorial and prompted him to capture the eluding, evasive essence of reverberating symmetry that beats inside the bosom of all natural phenomena. That is why we find inscriptions of suns, moons, stars on stones and some mystical pattern in the alignments of those monuments to natural events like sunrise and sunset while many others are related to pure geographical considerations. What was undoubtedly present in most of these ancient architectural beauties is an attempt to regulate man's worldly activities as according to the rhythmic occurrences of natural events like solstices, seasonal variations, floods and tides, onset of monsoon, planetary motion and alignments and imagining their influence on life etc. In an attempt to capture the interconnectedness of man and the natural world the geometry of construction had to be instilled with a spiritual essence and thus aestheticization of architecture took place.

In a country like Egypt many temples are found to have been built in an east-west direction reflecting the extreme importance of North-South running Nile River in determining their position. While most of the temples near the river Nile were influenced by the course river itself, temples built in oases far from Nile were mostly influenced by astronomical alignments. Rising of the stars Sirius and Canopus was associated with the onset of flood in River Nile and this also prompted many temples to align in a way which diverged greatly from predominantly east-west position.

Many pyramids belonging to ancient Mesoamerican age also were oriented and aligned according to astronomical considerations. The pyramids mostly belonged to the people from some urban areas who were collectively united by social, communal, religious and ritualistic bonds. Considerations about summer and winter solstice sunrises formed the main basis behind peculiar alignments of those mesoamerican pyramids and places of worship. Thus we see how religious thoughts and architectural beauties continued to evolve hand in hand while sharing an unbroken and indivisible bond. Sunrise or sunset on particular dates can be linked with the observational signature of recurrent patterns of various calendrically significant intervals which in turn influenced alignments of various archaeological sites. Other than astronomical considerations, events of local significance also provided the people of those times with a solid basis for the orientation of the sites. Rituals and myths also played a great role in defining the alignments of many of those locations. Myths, according to Walter Burkert encompass the act of telling of tales "with suspended reference structures by some basically human action pattern" (Burkert, 1979: 57), while rituals are 'stereotyped action(s) redirected for demonstration' (Burkert, 1979: 57). The constellation which we now know as Ursa Major or the Plough consisting of seven brightest stars was known to Egyptians as Meshkhet and their hieroglyphics show how it was directly associated with their observance of certain rituals for the dead and that in turn proved significant in determining orientation of some of their temples. The Egyptian temple of Karnak was built in a direction perpendicular to the course of river Nile and it was done to align the temple to the rise of the sun during winter solstice.

The temples of Babylon have also been described in different places as architectural pieces bearing symbolic cosmic relevance. The images of Sun stood in the midst of temple surrounded by all other deities and divinities; the temple of the Sun was also considered to be the place of paramount interest in the Babylonian religion and the image of Sun in the temple was surrounded by images of suns of other nations and also by the images of Mars, images of Moon, Mercury, Jupiter etc. Thus Sun has always played a pivotal role in the evolution of astronomical and religious outlook of man.

In the Persian culture Mithraic caverns represented the world as Mithra himself, the father of the Universe. The Egyptian pyramids in the same vein represent the essence of Egyptian religion as these were the tombs of the Pharaohs, who were believed to be the sons of Ra, the god of Sun or Sun itself. Temples, pyramids and inscriptions engraved on their walls all symbolize man's attempt to localize the ultimate form of sacred divine spirit which was the temple of the heavens itself. Sun almost always played the central role in the hierarchical arrangement of divine offices. Gaston Camille Charles Maspero in his 'Egyptian Archaeology' remarks about the similarities between the World and the Egyptian temples: "The temple was built in the likeness of the world, as the world was known to the Egyptians." (Egyptian Archaeology, 145-146).

The ancient temples thus can be seen to have played a very important role in establishing a connection between heaven and the earth as they all linked earth to the sky and were most often precisely aligned with the direction of the rising or setting sun, and other astronomical bodies like the moon, a star, a planet or any important day of the year. The underground ceremonial chamber of the Anasazi, prehistoric Mesoamerican civilization of the American Southwest, the temple of Egyptian New Kingdom, sacred platforms in Mexico – all share one thing in com-

mon which is that they all are oriented very precisely to some astronomically significant direction. Thus it can be easily deduced that science, especially astronomy played a very important role in shaping the cultural mold of the civilizations in ancient ages. Roman architect Marcus Vetruius Pollio said, "One who professes himself as an architect should be acquainted with astronomy and the theory of the heavens" (The Ten Books on Architecture, 1.1.3). Recurrent themes of rhythmic patterns of birth, death and rebirth form some of the most important subjects of the engravings and depictions as found on the walls of the temples and man's desire to artistically visualize the cosmic order of things by patterning it after the order manifested in the microcosmic world of mundane reality form one of the most significant drives behind those architectural designs.

The walls and ceilings of the Temple of Hathor at Dendera in Egypt are covered with figures and images of high astronomical significance. The temple's main axis might have been pointed at a star in the constellation Big Dipper or Plough. In 'Architecture, Astronomy and Sacred Landscape in Ancient Egypt' Giulio Magli provides an in-depth analysis of the pivotal role played by astronomy behind the creation of the pyramid complexes at Giza, Abusir, Saqqara, and Dahshur, earliest distinct "royal necropolis" at Abydos and new Kingdom Theban temples.

The pattern of space and time can also be found in many other shapes and forms like The Flower of Life which is in fact the modern name given to a highly sacred ancient geometry symbol used in many cultures and the Ouroboros or the symbol used to express ideas about infinity also tell us about the beliefs of ancient people regarding space and time. The Flower of Life is a perfect specimen of architectural beauty fused with astronomical considerations for it symbolically represents the basic pattern of organization of every fundamental building blocks of creation like molecules, atoms, cells etc. in macroscopic objects. The oldest known Flower of Life was discovered at the Temple of Osiris at Abydos, Egypt but many such depictions or miniature representations of Flower of Life have been found in different countries from around the world. The Ouroboros has also been found in different sites associated with ancient Greek, Egyptian and Phoenician cultures.

Another important example of application of knowledge of astronomical observation for practical use was the Antikythera mechanism of the Greeks. This mechanism consists of an ancient form of analogue computer and orrery to predict astronomical alignments and eclipses for astrological and calendrical purposes. This device was breathtakingly amazing for incorporating many subtle structural arrangements like carefully placed cog wheels and faint texts inscribed over and below the surfaces and until the arrival of modern Cathedral clocks no such neatly constructed device for timekeeping purpose was known.

In the modern period too we find commingling of astronomical consideration with architectural beauties in the construction of different Churches. In the Church of Santa Maria Novella in Florence Egnazio Danti, cosmographer of Cosimo I de' Medici, designed an astronomical tool to observe the variations of Solar motion by means of meridian line. The spot through which sun's rays pour into the dark interior of the Church gave Danti an invaluable tool to observe with unprecedented accuracy variations in sun's motion and its accurate position in the 16th Century. Later Dr. Gian Domenico Cassini of Genoa using the meridian line at the Bologna Cathedral of San Petronio could determine the variations in sun's diameter over the course of the year, with an unprecedented accuracy that surpassed all other observations made up to that point of time. The Church at Firminy by Le Corbusier also has some astronomical significance ingrained in its very fabric. It has some organized openings which bear a direct reference to the constellation of Orion and the light boxes are designed to let light rays enter through on specific occasions of religious holidays like Good Friday or Easter Sunday. Thus as a powerful specimen of archaeoastronomy it epitomizes the essential spirituality of geometry and can be said to have transcended or metamorphosed the earthly nature of construction to a heavenly one.

If in the ancient period architectural masterpieces like Stonehenge, Newgrange, Chichen Itza and Caraco Tower are guided by astronomical knowledge about stellar alignments, solstice and equinox alignments or apparent alignments with Venus, in the timeframe spanning from 16th to 17th Century we find many castles, observatories, lecture halls and libraries were built for the purpose of determining accurate planetary and stellar positions and for housing instruments dedicated to the astronomical observations. Some of such important observatories are Old Greenwich royal Observatory which was primarily built for solving the problem of determining exact longitude, five observatories of Jantar Mantar (built within 1724-1730 AD) located at the states of New Delhi, Jaipur, Varanasi, Ujjain and Mathura, Altazimuth Pavillion etc. In the modern period which encompasses the period starting from 20th Century up until today we find highly complex and powerful telescopes, research facilities and even orbiting observatories are being made primarily for research purposes which also smack of a high level of aesthetic elegance. Mt Wilson Telescopes, Cal Tech Keck I and Keck II observatories, The Karl G. Jansky Very Large Array (VLA) radio astronomy observatory, The James Webb Space Telescope (JWST), NRAO, Hubble Space Telescope are among such architectural specimens which combine the best of our spirit of scientific endeavor and artistic outlook. We have now space stations in the form of habitable artificial satellites like the ISS (International Space Station) which not only serve as microgravity and space environment research laboratory

but also epitomize the spirit of art combined with the engineering prowess at its peak. There are highly powerful extremely large telescopes under construction which will destroy any remaining barrier between instruments of observation and observatories themselves. These instruments which are about to change the face of astronomy and architecture forever are The Thirty Meter Telescope, European Extremely Large Telescope (E-ELT), James Webb Space Telescope, The Giant Magellan Telescope and The Large Synoptic Survey Telescope. Besides these there will be the dynamic, celestial-inspired architectural masterpiece like 38,000-square-meter Shanghai Planetarium of China which will combine the rich heritage of Chinese astronomy and a glimpse into its ambitious future in space exploration. The Oculus, the Inverted Dome and the Sphere will all serve to aestheticize one's dynamic astronomical experiences. The centrally located Oculus will keep track of sun's movement across the sky thus marking very accurately the passage of time while the great Inverted Dome will offer rich and spectacular views of the sky and the magnificent, pearl-like Sphere will contain the Optical Planetarium Theater itself.

CONCLUSION:

As science continues to progress different aspects of Universal reality is dawning before us and each is more puzzling than the one preceding it. We find complex but beautiful and enigmatic aspects of Universe are getting revealed with every new discovery. The isotropy and the homogeneity of Universe on a large scale; the existence of Walls, Webs and Filaments composed of clusters of galaxies and interspersed by dark Voids; the realization that we are made of the same stuff with which stars or galaxies are made; the possibility of hidden dimensions compactified in manifold; the complex beauty of possible fractal structure of Universe; the beauty of the dying star or planetary nebulae; the beauty of the probabilistic wavelike reality of quantum mechanics in which anything is possible at anytime and the possibility that our own Universe is but the result of vibrating pulses of energy rhythmically emanating from bundles of strings not quite unlike what Pythagoras once thought in his time – all these point toward a growing realization of the aesthetic spirit ingrained in the very fabric of the universe's architecture. The Universe itself might be some form of simulation which is informational in nature or it can be an extension of our own consciousness or God himself might be the player of this great game of Universal simulation. So everything in this universe should be brimming with life, all being an expression of the idea of a Supreme Power. Two particles can be entangled as if "mentally" connected and can communicate over immense spatial distance much faster than light and this also makes us think about a hidden higher-dimensional space or hyperspace through which this communication is possible. The multiverse theory helps us to visualize our cosmos like one of countless number of bubble verses residing in a hyperspace. The entire creation might be the result of some interplay among different sets of dualities which permit only certain sets of physical laws to exist while suppressing or forbidding many other kinds of arrangements of physical principles. The portrait of granular nature of spacetime would be complete if we can discover the existence of graviton particles.

Whatever revelation might be awaiting us in the long, arduous road of our journey towards discovering the truth behind all truths, our relation to Universe and its Creator can only be realized most perfectly only when we are able to grasp the depth and profundity of the joyous spirit of creativity that flows beneath the material crust of any geometrical superstructure. This spirit manifests itself in the beautifully complex yet elegantly simple structure of our physical reality.

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